

Small Mammal Communities in Streamside Management Zones

DAGMAR P. THURMOND¹ AND KARL V. MILLER²
*Daniel B. Warnell School of Forest Resources
The University of Georgia, Athens, Georgia 30602*

ABSTRACT—Populations of small mammals were sampled in six streamside management zones (SMZs) of three widths: narrow (15 m), medium (30 m), and wide (50 m), which extended through a three-year-old pine plantation. We also sampled the pine plantation and a nearby mature riparian forest. Two hundred and twenty-eight small mammals from 12 species were captured in 8,640 trapnights. Overall, capture rates were not related to SMZ width. During summer, capture rates were greater in the mature riparian forest than in SMZs. Abundance of individual species varied among the habitats sampled. SMZs supported populations of *Oryzomys palustris*, *Ochrotomys nuttalli*, and *Neotoma floridana*, three species not found in the pine plantation. Inclusion of SMZs in pine plantation management can enhance habitat diversity and contribute to local diversity of the small mammal community.

Approximately 8.5 million hectares in the southern United States is maintained in pine plantations (United States Department of Agriculture, Forest Service 1988), much of which is managed on short rotations. Although young pine plantations provide seasonal habitat needs for several mammalian species including white-tailed deer (*Odocoileus virginianus*), eastern cottontails (*Sylvilagus floridanus*), and oldfield mice (*Peromyscus polionotus*), other later-successional species may be low in abundance or absent.

Streamside management zones are designed to protect water quality from potential impacts of silvicultural operations. SMZs also add habitat diversity to the surrounding pine plantations. Additionally, SMZs create an area of edge, which increases the number of niches available to wildlife.

Squirrel (*Sciurus* spp.) use of SMZs is greater than in adjacent upland pine-hardwood areas in Mississippi (Warren and Hurst 1980) and Alabama (Fischer and Holler 1991), and greater than in adjacent pine plantations in Texas (McElfresh et al. 1980). Studies in eastern Texas indicated that squirrels were more abundant in wide SMZs (>55 m) than in narrow SMZs (<25 m). Conversely, small mammals were more abundant in the narrow SMZs (Dickson and Huntley 1987,

¹ Present address: Shoal Creek Ranger District, Talladega National Forest, Heflin, Alabama 36264.

² Reprint requests.

Dickson and Williamson 1988). Nevertheless, the relationships between SMZ width and small mammal communities have not been investigated adequately. We censused the small mammal communities in SMZs of varying width, in adjacent pine plantations, and in mature riparian areas.

MATERIALS AND METHODS

Study areas were located in the Upper Coastal Plain of Georgia on the Ogeechee River drainage in Jefferson and Emanuel counties. All SMZs were along first order streams in a 450-ha pine plantation owned by Federal Paper Board Company. The stand was clearcut in 1985, the site prepared chemically, and planted in a 2-m X 3-m spacing to loblolly pine (*Pinus taeda*) in 1987. All SMZs were selectively harvested. Remaining overstory in the SMZs was dominated by blackgum (*Nyssa sylvatica*), tulip poplar (*Liriodendron tulipifera*), red maple (*Acer rubrum*), sweetgum (*Liquidambar styraciflua*), and loblolly pine. Understory composition in the SMZs was dominated by blackberry (*Rubus* spp.), greenbriar (*Smilax* spp.), poison ivy (*Toxicodendron radicans*), gallberry (*Ilex glabra*), and fetterbush (*Lyonia lucida*).

Three width categories of SMZs were compared using two replicates of each: narrow (15–18 m), medium (28–30 m), and wide (49–53 m). Additional plots were established along two creeks in mature, riparian forests on Old Town Plantation near Louisville, Georgia. Streams in these forests averaged 2 m in width and were at least 100 m away from any forest edge. Dominant overstory included loblolly pine, cypress (*Taxodium distichum*), hickory (*Carya* spp.), oaks (*Quercus* spp.), sweetgum, and red maple.

Populations of small mammals were sampled by removal trapping along a 200-m transect in the center of each SMZ and along the stream in the mature riparian area. An additional transect was established just inside the outer edges of the medium and wide SMZs. Parallel 200-m transects were sampled in the adjoining pine plantations, 50 m from the SMZ edge. Transect paths were lightly cleared for access. Ten trapping stations were placed at 20-m intervals along each transect.

Small mammal populations were censused during four consecutive nights in December 1990, June 1991, January 1992, and June 1992. Sampling did not occur on rainy days. One Victor™ mouse trap, a Victor™ rat trap, and a pitfall trap were placed at each trapping station. Snap traps were baited with a mixture of peanut butter and peanut oil. Pitfall traps (10-cm diameter, and filled to a depth of 7 cm with water) were used to increase trapping success for shrews. Shrews

are difficult to catch with conventional snap or live traps (Szaro et al. 1988, Rose et al. 1989). Captured animals were donated to The University of Georgia Museum of Natural History.

Captures were combined by season over the 2-year trapping period and treated as replicates. Differences in mean capture rates were tested by analysis of variance, and Duncan's Multiple Range Test was used to separate means ($\alpha=0.05$).

RESULTS AND DISCUSSION

We captured 228 small mammals from 12 species in 8,640 trapnights. Southern short-tailed shrews (*Blarina carolinensis*) accounted for 24.5% of all captures. White-footed (*Peromyscus leucopus*) and cotton mice (*P. gossypinus*) were grouped together as cotton mice, because of the difficulty in positive identification. Morphological criteria used to separate the species are of limited value when applied to subadult mice (Dickson and Williamson 1988). Cotton mice accounted for 20.2% of the animals caught, followed by cotton rats (*Sigmodon hispidus*, 17.1%), old-field mice (*Peromyscus polionotus*, 13.6%), least shrews (*Cryptotis parva*, 11.0%), rice rats (*Oryzomys palustris*, 7%), and golden mice (*Ochrotomys nuttalli*, 3.1%). Other species captured included the woodrat (*Neotoma floridana*), Eastern harvest mouse (*Reithrodontomys humulis*), Southeastern shrew (*Sorex longirostris*), pine vole (*Microtus pinetorum*), and Eastern mole (*Scalopus aquaticus*).

During winter sampling periods, small mammal capture rates did not vary by treatment ($P = 0.56$). However, in summer total capture rates were greater in the mature riparian forest than in the other habitats sampled. Several species showed significant habitat preferences (Table 1). During both winter and summer, cotton mice were trapped more frequently in the mature riparian forest than in the other habitats sampled. The preferred habitat for the cotton mouse is bottomland hardwood forest subject to frequent flooding (Cothran et al. 1991). Cotton mice were equally abundant in SMZs and pine plantations.

In winter, oldfield mice were most common on the pine transects. Several studies have reported the preference of oldfield mice for early successional habitats (Golley et al. 1965, Brooks 1992). Oldfield mice, harvest mice, and cotton rats prefer areas with stands of dense grass. Cotton rats were caught most frequently in narrow SMZs in winter, and no habitat preference was observed in summer. The rice rat was not recorded in the pine plantations in either season. Southern short-tailed shrews, which prefer moist habitats (Szaro et al. 1988), occurred

Table 1. Small mammal capture rates ($\bar{x} \pm SE$) per trapline by species, season, and treatment over two years of trapping near Louisville, Georgia.¹

Season	Treatment	n ²	Cotton Mouse	Oldfield Mouse	Cotton Rat	Rice Rat	Southern Shrew	Short-tailed Shrew	Golden Mouse
Winter									
	3-yr-old plantation	12	0.08±0.08B	1.92±0.51A	0.42±0.33B	0	0.25±0.13AB		0
	Narrow SMZs	4	0.50±0.50B	0.50±0.29B	3.50±1.50A	0.50±0.50	0	B	0
	Medium SMZs	8	0.50±0.27B	0.25±0.25B	0.38±0.18B	0.62±0.32	0.50±0.27AB		0
	Wide SMZs	8	0.25±0.16B	0.13±0.13B	0.50±0.27B	0.38±0.38	1.38±0.59A		0.38±0.38
	Mature Riparian Forest	4	3.75±1.65A	0	0	0	0.50±0.50AB		0.25±0.25
Summer									
	3-yr-old plantation	12	0.75±0.18B	0.25±0.12	0.50±0.15	0	0.67±0.22		0
	Narrow SMZs	4	0.25±0.25B	0	0.50±0.50	0	0.50±0.29		0
	Medium SMZs	8	0	0	0.50±0.27	0.38±0.18	0.88±0.23		0
	Wide SMZs	8	0.13±0.13B	0	0.13±0.13	0.25±0.16	1.50±0.42		0
	Mature Riparian Forest	4	2.75±1.80A	0	0	0.25±0.25	1.50±0.29		0
Season	Treatment	n ²	Woodrat	Least Shrew	Southeastern Shrew	Pine Vole	Eastern Harvest Mouse	Eastern Harvest Mouse	Eastern Mole
Winter									
	3-yr-old plantation	12	0	1.25±0.41	0	0.08±0.08	0.16±0.11		0.08±0.08
	Narrow SMZs	4	0	0	0.25±0.25	0	0		0
	Medium SMZs	8	0	0	0	0	0		0
	Wide SMZs	8	0.13±0.13	0.50±0.50	0	0	0		0
	Mature Riparian Forest	4	0	0	0	0	0		0
Summer									
	3-yr-old plantation	12	0	0.25±0.12	0	0	0		0
	Narrow SMZs	4	0	0.50±0.50	0	0	0		0
	Medium SMZs	8	0	0	0	0	0		0
	Wide SMZs	8	0	0	0	0	0		0
	Mature Riparian Forest	4	0.25±0.25	0.25±0.25	0	0	0		0

¹Means followed by the same letter or a blank, within the same season and column, are not significantly different at $P = 0.05$ (Duncan's Multiple Range Test).

²Number of traplines per treatment.

in all habitats, although they tended to be caught most frequently in the mature riparian forest.

In summer, mature riparian areas were dominated by the cotton mouse, and, along with wide SMZs, were the only areas in which golden mice and woodrats were found. These species often prefer mature hardwood forest habitat, where they eat insects, twigs, green leaves, berries, seeds, and nuts (Cothran et al. 1991). The wide SMZs in our study provided some habitat for species associated with mature stands, such as the golden mouse and the woodrat.

Our results suggest that the species composition of the small-mammal community was affected by SMZ width. Only wide SMZs (49–53 m) maintained populations of small mammal species that are characteristic of mature riparian forests. Rice rats, golden mice, and woodrats were captured in the SMZs, but not in the adjacent pine plantations. Inclusion of SMZs in pine plantation management can enhance habitat diversity and thereby contribute to local diversity of the small mammal community.

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